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Evaluation of sleep quality in children with allergic rhinitis

Özlem Kemer Aycan[1], Özlem Özcanlı Çay[2]
[1]Department of Pediatrics, Faculty of Medicine, Balıkesir University, Balıkesir, Turkiye
[2]Department of Pediatrics, Balıkesir City Hospital, Balıkesir, Turkiye

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ABSTRACT

Aims: Sleep disturbance in allergic rhinitis patients ranges from mild disturbance to sleep apnea. Sleep disturbance in children can lead to problems such as excessive daytime sleepiness, irritability, decreased immune system and memory problems. In our study, we aimed to reveal the factors affecting sleep quality by applying the level-2 dsm 5 sleep scale to the parents of children aged 6-17 years diagnosed with allergic rhinitis.

Methods: Between August 1, 2023 and April 30, 2024, 79 children between the ages of 6 and 17 who were diagnosed with allergic rhinitis and whose parents/guardians agreed to participate in the study and 80 children without allergic complaints who applied to the outpatient clinic for any reason were included as the control group.

Results: There was no statistically significant difference between the case group diagnosed with allergic rhinitis and the control group in terms of gender, age, body-mass index (kg/m^2), residential area, mother work status, father job status and household income. A statistically significant difference was found between the level-2 6-17 years sleep disorder scale administered by the parents and the level-2 11-17 years scale answered by the case group ($p<0.05$), while no relationship was found between the level-2 11-17 years sleep disorder scale answered by the children and the control group ($p>0.05$). No statistically significant difference was found between symptom duration, gender, body mass index, seasonal variability, residential area, mother work status, father job status, household income, and sleep disorder scale ($p>0.05$).

Conclusion: Our study revealed that sleep problems were observed more frequently in children with allergic rhinitis in accordance with the literature. When we classified the case group as persistent and intermittent AR, no difference was observed, but a significant difference was found compared to the control group. In the case group with allergic rhinitis, no difference was observed in terms of scale score as symptom duration increased.

Keywords: Sleep quality, children, allergic rhinitis, sleeping disorder

INTRODUCTION

Allergic rhinitis is a very common disease in the society. Although its prevalence is defined between 10% and 30% in adults, this rate approaches 40% in children.[1] Considering that the prevalence of common rhinoconjunctivitis in children varies between 8-15%, allergic rhinitis is a common disease that is not chronic but affects quality of life. The classic triad of allergic rhinitis is sneezing, nasal itching and nasal congestion. Although allergic rhinitis can be seen at any age, its frequency increases after the age of 2. Nasal congestion and runny nose in children with allergic rhinitis affect the quality of life. Sleep is a part of living a healthy life. Although sleep disorders are commonly observed in children, their prevalence varies between 11% and 47%.[2] Sleep disturbance in allergic rhinitis patients ranges from mild disturbance to sleep apnea. The assessment of sleep quality in children with allergic rhinitis may vary depending on the age of the child, the severity of symptoms and other underlying factors. Therefore, a combination of several different methods to assess a child's sleep quality is usually the most effective approach.[3] In addition, controlling the symptoms of allergic rhinitis with an appropriate treatment plan may improve the child's sleep quality. In our study, we aimed to reveal the factors affecting sleep quality by administering the level-2 6-17 years DSM-5 sleep scale to the parents of children aged 6-17 years in the case group diagnosed with allergic rhinitis and the control group and the level-2 11-17 years DSM-5 sleep scale to the adolescent age group. Sleep disturbance in children may lead to problems such as excessive daytime sleepiness, irritability, decreased immune system and memory problems. At the same time, sleep health should be taken into consideration and necessary precautions should be taken as it leads to problems such as depression, growth retardation, metabolic dysfunction and hypertension.

Corresponding Author: Özlem Kemer Aycan, ozlemaycan@outlook.com

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METHODS

The ethics committee of the study was approved by Balıkesir University Faculty of Medicine Clinical Researches Ethics Committee with the decision E.346422. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The study included 79 children aged 6-17 years with allergic rhinitis diagnosed with allergic rhinitis and 80 children without allergic complaints who applied to the outpatient clinic for any reason between August 1, 2023 and April 30, 2024 at Balıkesir University Health Practice Pediatrics outpatient clinic between August 1, 2023 and April 30, 2024 as the control group.

Allergic rhinitis was diagnosed with the presence of at least two of the symptoms of runny nose, nasal congestion, sneezing and nasal itching for more than 1 hour per day and at least 2 consecutive days. According to the frequency of symptoms, it was classified as intermittent in the presence of complaints shorter than 4 weeks and less than 4 days a week, and persistent in the presence of complaints longer than 4 weeks and more than 4 days a week (National Allergy and Clinical Immunology Society of Turkiye, Allergic Rhinitis Diagnosis and Treatment Guideline 2022) It was aimed to reveal sleep quality and sleep disturbance by using the sleep disturbance scale in children with allergic rhinitis complaints. Parents were administered the DSM-5 level 2 6-17 years sleep disorder scale and the adolescent group was asked to answer the DSM-5 level 2 11-17 years sleep disorder scale by themselves. The DSM-5 level 2 sleep disturbance scale was arranged as multiple-choice as never, very little, a little, quite often, often, and the degree of sleep disturbance in the last week. In this scale, a minimum score of 8 and a maximum score of 40 are obtained and the higher the score, the more severe the sleep disorder is. The reliability and validity of the DSM-5 level-2 sleep disorder scale (parent form for 6-17 years and child form for 11-17 years) have been shown in Turkish children.[4] The inclusion criteria for the case group were being younger than 18 years of age, having a diagnosis of allergic rhinitis, not using chronic medication, and agreeing to participate in the study; for the control group, being younger than 18 years of age, not having a diagnosis of allergic rhinitis and other allergic diseases, and not using chronic medication.

Statistical Analysis

SPSS 23.0 package program was used for statistical analysis of the study. Descriptive statistics of continuous variables were shown as mean, standard deviation, median, minimum and maximum values, and categorical variables were shown as frequency and percentage. The compatibility of continuous variables with normal distribution was examined by Shapiro Wilk test. One-way analysis of variance (ANOVA) was used for comparisons of 3 or more groups of normally distributed continuous variables. Mann Whitney U test was used for 2 group comparisons of variables that did not show normal distribution and Kruskal Wallis test was used for 3 or more group comparisons. Pearson chi-square, Yates corrected chi-square and Fisher exact chi-square tests were used for group comparisons of categorical variables. In all statistical comparisons in the study, comparisons with p values below 0.05 were considered statistically significant.

RESULTS

179 people were included in the study. The patient group consisted of 90 people who were diagnosed with allergic rhinitis and the control group consisted of 89 people who were admitted to the pediatric outpatient clinic for any reason and who were not diagnosed with allergic rhinitis. The age range of the people included in the study was between 6 and 17 years. The mean age was 11.1±2.1 years. Of the participants, 48% were girls and 52% were boys. 64.8% resided in the urban area. The survey questions were answered by 53.1% mothers. There was no statistical difference between the case and control groups in terms of gender, age, BMI (kg/m^2), residential area, mother work status, father job status and household income (Table 1).

Table 1. Demographic characteristics of the patient and control groups

Demographic data	Variables	Patient, n (%)	Control, n (%)	p
Gender	Female	43 (24)	43 (24)	0.8
	Male	46 (25.6)	47 (26.4)	
BMI (kg/m2)	<3p	2 (1.1)	9 (5)	0.13
	3p-10p	15 (8.3)	27 (15)	
	10p-25p	43 (24)	32 (17)	
	25p-50p	23 (12)	21 (11)	
	50p-75p	6 (3,3)	1 (0.5)	
Residential area	City	59 (32)	57 (31.8)	0.2
	Rural	30 (16)	33 (18.4)	
Mother work status	Working	38 (21.2)	42 (23.4)	0.08
	Not working	51 (28.4)	48 (26.8)	
Father job status	Working	82 (45.8)	88 (49.1)	0.11
	Not working	7 (3.9)	2 (1.1)	
Household income	Low (<20,000 TL)	35 (19.5)	42 (23.4)	0.15
	Middle (20,000-50,000 TL)	32 (17.8)	27 (15)	
	High (>50,000 TL)	22 (12.2)	21 (11.7)	

Among the participants, 89 people constituted the case group diagnosed with allergic rhinitis. Allergic rhinitis symptom duration was over 1 year in 15% of the patients. Antihistamine use was 45% and nasal steroid use was 67.4%. Nocturnal snoring was present in 60% and sleeping with open mouth in 48.3%. No significant correlation was found between symptom duration and sleeping with open mouth, night snoring, antihistamine and nasal steroid use in the patient group (p>0.05). Total IgE values were 158±212.3 kU/L. In the skin prick test performed in the group diagnosed with allergic rhinitis, 56% had no specificity, 28% were sensitized to pollen, 5% to cat dander and 11% to house dust mites. In terms of other concomitant allergic diseases, 46% had no comorbidities while 28% had asthma (Table 2).

A statistically significant difference was found between the level-2 6-17 years sleep disorder scale administered by the parents and the level-2 11-17 years scale answered by the case group (p<0.05), while no relationship was found between the level-2 11-17 years sleep disorder scale answered by the children and the control group (p>0.05) (Table 3).

Table 2. Characteristics of the patient group diagnosed with allergic rhinitis

Variables (Fact)		n (%)
Symptom duration	<1 ay	11 (6.1)
	3 ay-6 ay	18 (10.1)
	6 ay-1 yıl	32 (17.9)
	>1 yıl	29 (15)
Antihistamine use	Yes	45 (50.5)
	No	44 (49.5)
Night snoring	Yes	54 (60.6)
	No	35 (39.4)
Sleeping with mouth open	Yes	43 (48.3)
	No	46 (51.7)
Nasal steroid use	Yes	60 (67.4)
	No	29 (32,6)
Concomitant allergic disease	Asthma	25 (28)
	Atopic dermatitis	18 (20.2)
	Food allergy	5 (5,6)
	None	41 (46)
Symptoms ≥4 days per week	Symptoms ≥4 days per week	48 (53.9)
		41 (46.1)

Table 3. DSM-5 level-2 sleep disorder questionnaire parent and child form comparison

	Case (mean±SD)	Control (mean±SD)	p
Level-2 6-17 years sleep disorder scale (Parent form)	24.9±3.2	18.07±1.9	<0.01
Level-2 11-17 year old sleep disorder scale (Child form)	21.8±4.4	21.1±4.2	0.7

No statistically significant difference was found between symptom duration, gender, body mass index, seasonal variability, parental employment status, family income, place of residence and sleep disturbance scale ($p>0.05$). No significant difference was found when allergic rhinitis patients were categorized as intermittent and persistent ($p>0.05$).

DISCUSSION

The classic manifestations of allergic rhinitis are a constellation of symptoms including sneezing, runny nose, itchy nose and nasal congestion. Sleep apnea may accompany or worsen the underlying symptoms in these children. Sleep apnea frequently accompanies sleep apnea in children, and its frequency was found to be between 1-5% in a study conducted in children aged 2-8 years.[5] When obstructive and non-obstructive causes were examined, obstructive causes were frequently shown. When the pathophysiology of allergic diseases is investigated, Th_2 cells start to differentiate after stimulation by any antigen and antigen-presenting cells (APC), T cells and other cytokines (IL-4, IL-5, IL-13) and Th_2 lymphocytes bind to B lymphocytes via MHC-II. IL-4 and IL-13 are secreted. IgE production starts by B lymphocytes. Th_2 lymphocytes secrete various cytokines that stimulate eosino-phylopoiesis (IL-5), mast cell development (IL-9) and goblet cells in addition to IgE production.[6]

Allergic rhinitis is a common disease, with a prevalence of 10% to 30% in adults and up to 40% in children.[7] Allergic rhinitis can occur at any age, but its prevalence increases after the age of 2 years.[8]

In many studies, sleep disturbance has been found to be associated with allergic rhinitis in both adults and children and a decrease in sleep scores has been shown in polysomnography. In addition to nocturnal sleep disturbance, allergic rhinitis has also been associated with nocturnal enuresis, snoring, obstructive sleep apnea, snoring and daytime sleepiness.[9] In our study, snoring and sleeping with open mouth were observed more frequently in the group with allergic rhinitis compared to the control group. Nocturnal sleep disturbances cause excessive daytime sleepiness and fatigue in children and may lead to weakening of the immune system, attention deficit problems, irritability, depression, growth retardation, hypertension, metabolic syndrome, decreased academic performance and increased substance use.[10] Therefore, sleep disturbance associated with allergic rhinitis may lead to outcomes that are not directly related to allergic rhinitis.[11]

Many questionnaire studies have been conducted to detect sleep disorders in children with allergic rhinitis. In cases where polysomnography is not available, these questionnaires may be guiding. One of these questionnaires is the Children's Sleep Habits Questionnaire (CSHQ). It is a parent-reported questionnaire designed to evaluate sleep problems in school-age children aged 4-10 years.[12] The Portuguese version of the CSHQ (CSHQ-PT) was developed to detect sleep disorders in children aged 2-10 years with the addition of psychometric measures.[13]

Allergic rhinitis may disrupt sleep mechanisms through various mechanisms. Increased airway resistance also poses a risk for obstructive sleep apnea. In addition, allergic rhinitis may lead to hypertrophy of the tonsils and adenoid gland. All these factors may contribute to sleep disturbance.[14] In allergic rhinitis, an increase in nasal turbinate edema also occurs in the typical lying position.[15]

Increased levels of histamine, IL-1b, IL-4, IL-10 and bradykinin have been found to be associated with poor sleep hygiene in patients with allergic rhinitis.[16] Increased levels of histamine, the basic architect of the sleep-wake cycle, contribute to sleep problems. Sleep problems associated with increased histaminergic response benefit greatly from antihistamine treatment.[17]

In a study investigating the relationship between allergic rhinitis and sleep disturbance, it was found that IL-1b, IL-4 and IL-10 levels were higher in patients with allergic rhinitis and were associated with shortened REM sleep with rapid eye movements.[18]

Increased free oxygen radicals and lipid peroxidation have been observed in children with obstructive sleep apnea. Increased oxidative stress, which is thought to be the result of chronic inflammation, may be similar in patients with allergic rhinitis.[19]

Our study revealed that sleep problems were observed more frequently in children with allergic rhinitis in accordance with the literature. When we classified the case group as persistent and intermittent AR, no difference was observed, but a significant difference was found compared to the control

group. A scale that had not been used before on patients with allergic rhinitis was administered. In children with attention deficit hyperactivity, the level-2 6-17 years DSM-5 sleep scale was administered to the parents of children aged 6-17 years and the level-2 11-17 years DSM-5 sleep scale was administered to the adolescent age group, and a correlation was found with eating disorder as the scale score increased.[20] Similarly, in our study, higher scores were recorded in patients with allergic rhinitis, while no difference was observed in terms of scale score as symptom duration increased in the allergic rhinitis case group.

CONCLUSION

Our study revealed that sleep problems were observed more frequently in children with allergic rhinitis in accordance with the literature. When we classified the case group as persistent and intermittent AR, no difference was observed, but a significant difference was found compared to the control group. In the case group with allergic rhinitis, no difference was observed in terms of scale score as symptom duration increased.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was initiated with the approval of the Balıkesir University Faculty of Medicine Clinical Research Ethics Committee Decision No: E.346422).

Informed Consent

The study was designed a cross-sectional study

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

*Cross-sectional article

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